

Problem Definition, Problem Sources, and Current Advantages to Reduce the Divide Between Formal and Empirical Analysis

I. PROBLEM DEFINITION

EITM opportunities for education (training), knowledge transmission, and research work teams are designed to bridge the gap between formal and empirical analysis by addressing the factors that have produced that gap. In their deliberations, EITM Workshop participants were in general agreement that the separation was somewhat natural and is not confined to political science. The divide exists in other social sciences, including economics, where individuals specialize in either formal or empirical analysis due to their level of mathematical background and the type and years of training the substantive area or field requires. The divide also exists in the other sciences. It was noted, for example, that epidemiology is much more comfortable with empirical modeling. The primary epidemiology journal, *The American Journal of Public Health* (AJPH), does not usually publish articles that have substantial formal modeling. The major funding organization for epidemiological research, NIH, tends to support very few formal modeling projects.

Differences between formal and empirical approaches occur in intellectual outlook, skills, training, and research focus. In terms of outlook, formal modelers typically emphasize, in minute detail, linkages between concepts, whereas empirical modelers do not want to spend their research time parsing through minute details that may not add to their understanding. Formal modeling also requires analytical, logical, and mathematical modeling skills, while empirical modeling is inductive and, therefore, places emphasis on descriptive and statistical skills. Workshop participants noted that the intellectual investment needed for formal modeling is greater; it requires more mathematical knowledge than does empirical modeling to analyze a problem of interest. Training priorities differ as well. Empirical modelers devote their energies to data collection, measurement, and statistical matters, while formal modelers center on mathematical rigor.

These differences in outlook, skills, and training are reflected in distinct research practices and outcomes. For empirical modelers, model failures lead to emphasis on more statistical training or more sophisticated uses of statistics—usually to “patch over”—a model failure (see Appendix A). Formal modelers, on the other hand, deal with model controversies by considering alternative mathematical formulations but this is usually done piecemeal. The basic framework, such as expected utility, usually remains in place. The one similarity, however, between these two approaches is that both formal and empirical modelers tend to remain tied to their particular technique despite the warning signals evidenced in model breakdown.

II. PROBLEM SOURCES

The literature in political science consists of a proliferation of non-cumulative empirical studies usually without any formal component. Computing power has made it possible for more detailed, robust, and sophisticated data analysis than ever before, but this has become an end unto itself. The number of empirical modeling articles far exceeds that of articles that use formal models. More importantly, the number of articles that combine formal and empirical analysis is very small.³ EITM Workshop participants singled out three leading sources for the current situation: compartmentalization, (under)graduate education, and career pressures.

A. Compartmentalization

Isolation—*compartmentalization*—of fields and sub-fields is the *status quo* in political science. Fields in political science, as reported by the American Political Science Association, include: American Government and Politics, Comparative Politics, International Politics, Methodology, Political Philosophy and Theory, Public Law and Courts, Public Policy, and Public Administration.⁴ This current field and sub-field structure exacerbates the separation between formal and empirical modeling. For example, focusing on a question that is particular to American Politics increases specialization and, turn, discourages integrating approaches and theories that would best come about from studying a particular research question in many countries.

Isolation of fields and sub-fields also results in conceptual redefinition and proliferation across fields.⁵ This intensifies measurement and theoretical problems while producing regressive research practices, fiefdom mentalities, and outdated views of formal and empirical analysis.⁶ One such outdated perspective about formal and empirical analysis is the assertion that these technical-analytical approaches are simply interesting intellectual enterprises that lack political and social relevance. This most basic form of misunderstanding about both formal and empirical analysis is only encouraged by compartmentalization. Why bother to model findings if one does not seek to generalize and predict in other areas?

In addition, the consequences of isolation between formal and empirical modeling can be found in problems of misspecification. Many formal modelers feel uncomfortable with powerful empirical concepts such as social norms, limited rationality, and psychological factors such as personality and identity.⁷ The usual argument is that formal models are not meant to fit data, or should not be. While there is much to be learned from pure theory and abstract

³This viewpoint is supported by an informal survey by EITM Workshop participant Carl Simon. He contrasts political science articles in the last twenty years. Starting with eighteen articles in two issues of the 1981 American Political Science Review (APSR) only one of these eighteen centered on formal modeling (6%). The other seventeen were purely empirical (94%) and none of the eighteen articles combined formal and empirical modeling. In the ensuing twenty years things change slightly in political science. In the sixteen articles in two issues of the 1998 APSR four articles were theoretical (25%). The other twelve were purely empirical (75%). There were no articles that combined formal and empirical modeling.

⁴For an extensive and important discussion of this issue and many others relevant to EITM, see Rebecca B. Morton, *Methods and Models: A Guide to the Empirical Analysis of Formal Models in Political Science*, New York: Cambridge University Press (1999).

⁵Consider the concepts of “Democracy” and “Power.” For a discussion of the conceptual problems associated with Democracy see David Collier and Robert Adcock, “Democracy and Dichotomies: A Pragmatic Approach to Choices and Concepts,” in Nelson Polsby (ed.), *Annual Review of Political Science*, Palo Alto: Annual Reviews (1999), pages 537-565. For a discussion of the concept of Power and a more general discussion of concept dimensionality see W. Phillips Shively, *The Craft of Political Research*, Upper Saddle River, New Jersey: Prentice Hall (1998, Fourth Edition), pages 27-36.

⁶Workshop participants pointed out that compartmentalization and segmentation has helped create a situation where a segment of the political science profession views formal and empirical modeling as one and the same.

⁷A good example of the consequences of formal modeling isolation can be found in psychology. Despite a growing literature in mathematical psychology, a perusal of the Journal of Mathematical Psychology reveals that mathematical modeling tends to be limited to the simplest of individual learning and perceptual phenomena.

formal arguments, the formal modeling isolation reinforces distance from basic circumstances that these abstract models could help to illuminate. This isolation also contributes to the basic misunderstanding noted above about the great attributes formal modeling brings to the scientific process.

Empirical modeling isolation, on the other hand, is equally guilty of not advancing scientific understanding when it fails to incorporate their “more complex and general assumptions” into a mathematically identified model with direct and testable implications. Instead “errors” or “confounding variables” that derail the inferential process are treated as statistical problems that require only statistical fixes.

In sum, EITM Workshop participants were in agreement that compartmentalization was not neutral in its effect. The effect is negative. It was proposed that one way to reduce the effects of compartmentalization was to separate political science into the study of domestic and international politics. Theory, data, and method would cover more general circumstances and lead to deeper understanding.⁸ For the purposes of reducing the formal and empirical modeling divide, the effect of reduced compartmentalization by substantive field would encourage integration between formal and empirical analysis.

B. (Under) Graduate Education

In an ideal world, political scientists should be educated to do research that incorporates five major components: 1) theory (informed by field work or some “puzzle”); 2) a mathematical model identifying causal linkages; 3) deductions and hypotheses; 4) measurement and research design; and 5) data collection and statistics. However, one or more of these components often is absent in political science research and, according to the EITM Workshop participants, the quality of formal and empirical modeling in political science is substandard.

There are at least two reasons for this state of research competency. One is that rigorous formal and empirical training is a somewhat recent development in political science. Another is that there are significant obstacles in the current political science training environment. The first obstacle is time. Students who desire training in both formal and empirical modeling will take longer to get a Ph.D. and most graduate programs do not have the resources to support students for more than four or five years. Consequently, students take the sequence of formal or empirical modeling classes but seldom both sequences. In addition to classes in formal or empirical modeling, students must take classes in their substantive area. For students in comparative politics there are field work and language requirements. What normally is sacrificed, then, is either the formal or empirical modeling sequence. Taking a single course in formal and empirical modeling is not nearly enough to develop competency to do research.

The second obstacle to establishing formal and empirical modeling competency centers on the training itself. The economics discipline is illustrative. Economics graduate students are required to take one full year (usually) of mathematics for economists. This mathematical (and quantitative) approach is reinforced in substantive courses which typically are taught as an analytic science in a theorem-proof mode.

Mathematical (quantitative) competency in most economics graduate programs is demonstrated not only in these foundational courses, but also in qualifying examinations in the summer after the first year of coursework. Students must clear this hurdle before being allowed to proceed with their Ph.D. Political science also has qualifying examinations but they are usually at the end of all coursework. Moreover, students are not required to take a qualifying exam in formal or empirical modeling unless that is considered one of their chosen fields of study. In fact, in some graduate political science programs students cannot make formal or empirical modeling a major field of study. The end result is that political science graduate students avoid developing basic competencies in formal and empirical modeling.

⁸An abbreviated list of research questions that are not studied adequately because of compartmentalization are: political corruption, size of government, levels and types of taxation, economic growth and development, public debt, inflation, failed democracy, democratic stability, regime transitions, the rule of law, property and political rights, ethnic conflict, coups and revolutions, and terrorism.

C. Career Pressures

In many cases, younger or innovative scholars are not encouraged to master formal modeling, empirical modeling, or a synthesis between the two. The pressure for junior faculty to publish and earn tenure can discourage (re)-tooling and acquiring competency in both formal and empirical modeling. Whether having earned tenure encourages re-tooling is an open question. Tenure allows for risk taking and a longer-term view of one's research, but it can also bring administrative demands and a grooved research record. These latter two factors are associated with risk aversion and complacency.

A discipline that provides few incentives for risk taking and re-tooling, but many for an assembly-line model of research production, is a discipline that imperils innovative theories and methodologies and, in turn, scientific breakthroughs. One could make the argument that EITM or initiatives like it are unnecessary because the unfettered marketplace of ideas expedites best scientific practices and progress. But, it is precisely because there are significant rigidities (training and otherwise) in the current academic setting (imperfect competition) which makes EITM-type initiatives not only necessary—but imperative.

III. EXISTING ADVANTAGES

Despite the obstacles to bridging the divide between formal and empirical modeling, political science possesses several qualities which have the potential to reduce this gap. One important quality stems from a perceived weakness in formal political theory—the lack of a general political equilibrium theory. William Riker characterized a general “political equilibrium” in the following way:

[politics] involves the amalgamation of individual preferences into a social choice and subsequent enforcement of that result. At this general level, the goal of political theory is to identify the conditions for an equilibrium of preferences. Such an equilibrium is a social choice that the members of every sub-group in the society that are capable of bringing about a social decision prefer to any other alternative. This equilibrium is one the society will arrive at for certain, regardless of its particular institutions; and if by reason of some obstruction the society is deflected from it or forced to abandon it, the society nevertheless will return to it if the obstruction is removed.⁹

A big attraction of general equilibrium analysis was, and is, the formidable analytic power or traction it provides. However, since the late 1940s, research on the question of a general political equilibrium has suggested that it does not, and will not, exist. It has been impossible to achieve due primarily to “the distribution of tastes in society.”¹⁰ As a result, politics and political science do not have a general equilibrium theory to facilitate standard solutions.¹¹

However, many of the assumptions that accompany general equilibrium theory are questionable. In particular, “clean” solutions often require assumptions such as perfect foresight, hyper-rationality, common knowledge, standard discounting, and expected utility maximization. These concepts have been contradicted over and over again by empirical evidence. That is, political science cannot realistically assume some of the analytical simplifications that allow the researcher to derive solutions relating individual behavior to a set of political factors.

⁹William Riker, “Political Theory and the Art of Heresthetics,” in Ada Finifter (ed.), *Political Science: The State of the Discipline*, Washington, D.C.: The American Political Science Association (1983), pages 47-67.

¹⁰*Ibid.*, page 51.

¹¹For a discussion of general equilibrium theory, see E. Roy Weintraub, *General Equilibrium Analysis: Studies in Appraisal*, New York: Cambridge University Press (1985).

Consequently and somewhat ironically, this “problem,” the lack of a general political equilibrium, means there are fewer impediments to adopting a new style of work emphasizing partial equilibrium. This approach would relax many of the standard general equilibrium assumptions, and rigor would be increased, not sacrificed so long as there was a commitment to merge formal and empirical analysis. Indeed, the thrust of recent work is that people behave in ways that are boundedly rational, and their motivations are better explained by work in cognitive psychology.¹²

Since political science is not strongly allied to general equilibrium theory, there is (and would be) far less discipline-wide resistance to the very complexities that economists avoid. Political science, therefore, in bridging the technical-analytical divide, would also be able to “skip an intellectual generation” and link formal and empirical models with richer concepts such as framing, limited foresight, and learning.

Another quality is the potential for collaboration between those who do field work and/or study history and culture, and those who wish to combine formal and empirical work. These opportunities include analysis of political (social) science problems that deal with (among other things) multiple goals of citizens (with and without limited choices), the endogeneity of rules, and preference changes (including regime shifts).

¹²Examples can be found in Arthur Lupia, Mathew D. McCubbins, and Samuel Popkin (eds.), *Elements of Reason: Cognition, Choice, and the Bounds of Rationality*, New York: Cambridge University Press (2000).